ATTACHMENT A

The Role of Embedded Cost in Universal Service Funding

Dale Lehman

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Summary

Embedded cost remains the most appropriate method for determining both eligibility and levels of universal service support. The Telecommunications Act of 1996 provides guidance for the role of universal service funding (USF), and makes access to reasonably comparable rates and services a key principle upon which the Commission must base its policies. The Act requires "specific, predictable, and sufficient" support mechanisms to achieve the paramount goals of universal service.[2] Efficiencies achieved through cost reduction are important, but only as they contribute to the overall goals of universal service. While forward-looking cost models may enhance incentives for cost-reducing innovation relative to embedded cost mechanisms, such models cannot guarantee that support will be either predictable or sufficient. This deficiency results from inherent difficulties in measuring forward-looking costs accurately, and the need to validate the cost levels estimated from such cost models.

The advantages of forward-looking cost are overblown, the disadvantages of embedded cost are overstated, and the claims that rural ILECs are inefficient are unproven. Forward-looking cost may be the appropriate *theoretical* economic cost concept, but embedded cost remains the best means for estimating these costs for small, rural companies. This conclusion results from a

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[2] 47 U.S.C. Section 254 (b) (5).

number of practical and theoretical considerations. Validation of forward-looking cost estimates is essential, and embedded cost is the only feasible method for validating the predictability and sufficiency of cost estimates. Notwithstanding the difficulties of implementing a forward-looking cost standard for large carriers, application of a forward-looking cost standard to rural carriers would encounter magnified problems. Inevitable errors in cost model methodology will not "average out" when applied to small companies. As a result, support levels are likely to be too low for some carriers and too high for others (unpredictability). To the extent that forward-looking cost methodologies produce cost estimates significantly below today's embedded cost levels, such cost estimates cannot be adequately validated and will not provide sufficient support to achieve the goals of the Act.

Outline of this Report

Section 1 establishes the relevant guidance the Act provides for measuring the cost of universal service provision. Section 2 then describes the relationship between embedded cost and forward-looking cost on both a theoretical and practical level. This section establishes that these cost concepts are fundamentally different, but related. In particular, their differences can be quantified – aside from speculative inefficiencies in current rural ILEC operations. To the extent that such inefficiencies can be documented and measured, their size also can be quantified. In the absence of such evidence, however, forward-looking cost models should produce cost estimates within an appropriate range of embedded cost. Such validation of any forward-looking cost model is essential if regulatory practice is to be consistent with the Act. Section 3 discusses the particular issues of estimating forward-looking costs for small, rural carriers. These

difficulties, along with the relationship between the two cost concepts, make continued use of embedded cost the appropriate choice for determining USF support for rural carriers.

Section 4 investigates investment incentives associated with alternative cost methodologies, and Section 5 discusses competitive issues. Section 6 offers my conclusions regarding the continued appropriateness of embedded cost for determining both eligibility and levels of USF support for rural carriers.

1. The Telecommunications Act of 1996

Section 254 of the Act contains principles to govern the methodology used for determining USF support. These include:

- §254(b)(1): "Quality services should be available at just, reasonable, and affordable rates."
- §254(b)(3): Consumers in high-cost regions should have access to services that "are reasonably comparable to those services provided in urban areas and that are available at rates that are reasonably comparable to rates charged for similar services in urban areas."
- §254(b)(5): "There should be specific, predictable, and sufficient Federal and State mechanisms to preserve and advance universal service."

While the Act has much to say about universal service, these are the only sections that govern how the level of support is to be determined. It is clear that the primary emphasis is on the support being "sufficient" and "predictable" and specific for the purposes of universal service. Ensuring that rural carriers achieve cost minimization is important, but only in that it serves these purposes. This is important because there is an inevitable tension between ensuring sufficient

support and pursuing efficiencies that reduce the cost of universal service goals. Both are desired, but this does not necessarily mean they can be achieved simultaneously without tradeoffs. To the extent that USF is based upon a presumption that rural ILECs could provide universal service more cheaply than currently, the sufficiency of support is called into question. If forward-looking cost estimates rest on speculative rural ILEC inefficiencies, then the burden of proof must fall on those that claim there are such inefficiencies.

As I demonstrate in the next section, forward-looking cost and embedded costs are related concepts that should not deviate markedly, unless current embedded costs include significant inefficiencies. The Commission must provide sufficient support. Thus, any reduction in USF that is based on assumed inefficiencies must contain a demonstration that these inefficiencies exist and are of sufficient magnitude to warrant a reduction in support.

2. The Relationship between Embedded Cost and Forward-Looking Cost

There are three types of cost measures and they answer three different questions:

- What did it cost? This is *embedded* cost.
- What does it cost? This is *forward-looking* cost.
- What might it cost? This is *speculative* cost.

The last two must be distinguished. Any forward-looking cost measure inevitably involves some speculation since the costs have not yet been incurred. The degree of speculation differs, however. A forward-looking cost estimate that is based on presumed changes in technology or operating procedures becomes speculative when those technologies or procedures are not being

employed today. In the following discussion, I will refer to forward-looking cost as the cost today, using current technology, input prices, and procedures.

Embedded cost and forward-looking cost are both current cost measures: one looks to the past and the other looks to the future, but they are both conducted today. If technology and/or input prices are changing, then the view backwards and forwards will necessarily differ. A simple example makes this clear: if I purchased a computer last year, then its embedded cost will reflect the price I paid for it last year.[3] If technology has been improving, then purchasing a new computer (with equal processing power) today should be cheaper than it was last year. Thus, today's forward-looking cost may be lower than the embedded cost. By the same token, if purchasing a labor-intensive service today (e.g., trenching for laying cable), then today's forward-looking cost may exceed the embedded cost. The two will generally be different, depending on changes in technology and changes in input prices.

Both embedded and forward-looking costs change as network deployment evolves. If technological progress is leading to lower forward-looking costs over time, then embedded costs also will be decreasing over time. The rate of decrease will be muted due to the presence of the embedded base of older equipment, but as this is replaced with newer assets, embedded costs also will decline. In a mature network (one for which new growth is small relative to the size of the current network), the time trend of costs should be relatively similar for both cost

[3] Even this simple example becomes complicated quickly. Today's embedded cost will reflect not only the initial purchase price of the computer a year ago, but also the depreciation rate and cost of money applied to the net investment that remains today. Depending on the depreciation rate relative to my replacement decision, the relationship between today's embedded cost and today's forward-looking cost will not be straightforward. I will describe the results of considering these complexities shortly.

methodologies. It is only discrete and abrupt changes in technology that produce large and discontinuous differences between embedded and forward-looking costs.

There are some additional differences between the two cost concepts. In the regulatory world, embedded costs often reflect prescribed depreciation lives – these have historically been set fairly long in order to reduce the revenue requirement, and thus prices, during the early years of an asset's life. Forward-looking cost uses economic depreciation that usually involves shorter asset lives. Embedded operating cost (this includes overhead, maintenance, labor, etc.) reflects the most recent actual cost experience of the firm, while forward-looking operating cost would reflect costs that would be incurred in the near future. Plant Loading or utilization rates (the amount of plant required to serve a level of demand) may also differ: embedded costs use utilization rates that are based on current plant in service while forward-looking cost assumes plant is placed to meet anticipated future demand. The choice of utilization rates affects the calculation of unit costs. Embedded cost necessarily reflects the accumulated effects of differences between forecasted and actual demand over time. Forward-looking cost may or may not reflect such differences, depending on the assumptions made regarding future demand levels.

We should only expect forward-looking costs to be substantially lower than embedded costs if technology is improving rapidly, or if input prices are rapidly decreasing, or if utilization of facilities is expected to rise rapidly. None of these conditions apply to rural ILEC loop costs for universal service. Some costs (e.g., maintenance) have declined over time while others have increased (e.g., conduit installation costs). Technological progress has been gradual and modest, particularly for loop plant. Utilization rates are likely to fall as intermodal competition increases.

Thus, the difference between embedded and forward-looking loop costs should not be dramatic – unless speculative efficiency gains are included in the latter estimate.

Switching costs present different issues for USF cost methodology. Switching costs have been dropping more rapidly while loop costs have not been dropping. Switching costs remain higher for smaller carriers, since scale economies still exist and switching capacity must be added in discrete increments. Increased modularity in switch capacities, and increasing use of IP-based technology, has begun to lower switching costs dramatically. To the extent that forward-looking switching costs are now significantly below embedded switching costs, the choice of cost methodology would appear to present quite different levels of provisioning costs for USF purposes. In this case, however, there is no justification for using the (presumably) much lower forward-looking switching costs rather than the embedded cost.

The problem is that today's embedded switching costs reflect efficient investment decisions in the past. Unless it can be shown that deployment of the switches currently in use was inefficient at the time these were installed, failure to permit cost recovery of these switches presents only illusory cost savings. If newer switching technology is cheaper than continued use of embedded switching equipment, then the old equipment should be replaced. This means that such equipment is economically obsolete and today's depreciation costs should reflect this fact. On the other hand, if new switching technologies are only less expensive if there was no embedded base of switches, then this potentially lower forward-looking cost is a dangerous illusion. It may represent a forward-looking cost for a new carrier with no existing network, but it does not

represent the forward-looking cost for a carrier that has an existing network with which they have been providing universal service in high-cost areas.[4]

It would be poor USF policy to base support on an assumption that new technology is now available that may be cheaper than the embedded base of equipment that is being used to provide universal service today. Either the embedded equipment has not been adequately depreciated to reflect this fact (past under-funding of universal service), or a one-time reduction in USF would be obtained at the expense of future investment in high-cost areas. Depriving carriers of recovering the costs of past efficient decisions whenever new technology becomes available will change their future decisions. It would become less rational to deploy technologies that may become obsolete in the future. This scenario would have deprived rural America of many services that are available today (e.g., today's switching capabilities). The future would be one in which only investments that can be recovered quickly would be undertaken – and this is precisely the opposite to the goals of universal service.

Switching is not the primary cost of universal service. Loop costs are the largest cost component of rural ILEC costs, and these have not been subject to the same rapid technological progress as switching. Elsewhere I have reported on simulations that compare embedded and forward-looking loop costs based on actual rates of technological progress as well as other factors relevant to these studies: the cost of capital, prescribed and economic depreciation rates, operating costs, and utilization rates.[5] The results of these simulations confirm that the two cost measures, when applied to ILEC loop costs, are generally quite close. 90% of the simulation

[4] This provides an additional reason why it is inefficient to provide USF to CETCs at the level of the rural ILEC's costs. CETCs may have different cost structures than rural ILECs.

[5] D.E. Lehman and D.L. Weisman. *The Telecommunications Act of 1996: The "Costs" of Managed Competition*. Kluwer Academic Publishers. 2000. Chapter 6.

runs show differences between embedded cost and forward-looking cost that range between embedded cost being 19% higher and 4% lower than forward-looking cost. There is no guarantee that forward-looking cost will be lower than embedded cost, though that is the more common case. The extent of the difference, however, is not large: 8.5% on average and 19% at the upper end of a 90% confidence interval. Validation of a forward-looking cost model would entail demonstrating that it produced cost estimates within this range of embedded costs for 90% of the jurisdictions it is applied to. Thus, if applied to all rural ILECs, this would mean that 787 out of the 874 rural study areas would need to fall in this range. Such validation poses an extreme challenge for the development of forward-looking cost models.

There is no similar finding regarding the relationship between embedded cost and speculative cost. If one is willing to speculate that future costs will be lower due to unspecified efficiency gains, then forward-looking cost will be correspondingly lower than embedded cost. Such an exercise requires validation, however. The results must be shown to be reasonable – for instance, with a showing of specific changes in technology or practices that would lead to measurable cost reductions. Absent such validation, forward-looking costs have no floor: they will be lower the more you are willing to speculate. Use of such speculative costs is poor regulatory practice for a number of reasons:

- The use of a speculative cost standard rewards investment in the regulatory process. This increases the resources consumed by regulation as well as inhibiting market forces from governing outcomes.
- Speculative costs are likely to be incorrect. Even if they are accurate, on average, some firms will receive windfalls and others will be short-changed on the basis of speculations that are not realized.

- Speculative costs are contrary to the provision of "sufficient and predictable" support.

3. Forward-looking costs have inherent estimation problems, particularly for small, rural carriers.

Forward-looking cost models are *models*: by definition, they are not designed to be 100% accurate. An essential difference between their application to large and small companies is that the inherent errors in modeling may cancel out when applied to large carriers but not for small carriers. For example, a cost model may not adequately depict topographic features that impact deployment costs (e.g., hilly or rocky terrain). With varying topographies, costs may be over-estimated in some wire centers and under-estimated in others. The average may not be seriously biased. At the other extreme, a small company may have a single study area – in this case, the modeling error may be severe. There is no opportunity to have the errors "average out" through application to multiple conditions. This imposes stringent requirements for cost model accuracy if it is to be applied to small, rural carriers.

Unfortunately, the state of forward-looking cost modeling does not achieve this degree of accuracy. Notwithstanding the considerable effort and achievements of the Hybrid Cost Proxy Model (HCPM), that model remains severely limited in terms of its ability to accurately measure costs. There are two problem areas: one involves inputs and the other is structural.

The problem with inputs is the need for disaggregated input data applicable to multiple small companies. Wage rates, maintenance costs, overhead expense, etc., are impacted by geography. The Rural Task Force has documented the diversity of rural settings that pose challenges for any

forward-looking cost model.[6] In addition, geo-coded location data is not as accurate in rural areas as in urban locations.[7] The need for accurate input data is hard (and expensive) to overcome, but not impossible. It is not clear that efforts to disaggregate the inputs would pass a cost-benefit test, however.

The need for validation suggests a costly administrative process with little hope for success. A model might estimate costs for a particular company of $40/month/line while that company may have an embedded cost of $55/month/line. Absent a specific showing of inefficiencies for that carrier, the presumption must be that the model missed something important. Perhaps the soil type was different than the model could accommodate. This could be fixed by introducing a new soil type with higher cost characteristics. It is easy to envision how this modeling process becomes more complicated and burdensome. It can only be avoided by not calibrating the model results to any actual data – but "validation is not an optional exercise."[8]

The difficulties of obtaining accurate input data are confounded and overshadowed by the inherent limitation of existing cost model methodology. Current models are static and deterministic. That is, they assume that customer locations are known with certainty and that a network can be designed instantaneously, using best available current technology, to serve those locations. As noted by many, including the FCC, this lack of dynamics and inadequate treatment

[6] See Rural Task Force White Paper 2, *The Rural Difference*, 2000.
[7] See, for example, M.R. Cayo and T.O. Talbot, "Positional error in automated geocoding of residential addresses," *International Journal of Health Geographics*, 2003, 2:10. According to this paper "error was found to increase as population decreased." In fact, in rural upstate New York, 95% of addresses were accurate to within 1.5 miles, while in urban areas 95% of addresses were accurate to within 0.2 miles.
[8] Statement made by Jeffrey Rohlfs in the FCC Staff Workshop on Proxy Models, January 14 and 15, 1997.

of uncertainty are limitations of current cost modeling methodologies. Some have suggested that these difficulties can be overcome through appropriate input choices.[9] Others are less sanguine.

Stephen Littlechild, the founder of price cap regulation, commented on a recent paper addressing this issue of dynamics with forward-looking cost methodologies:[10]

> However, the paper runs up against the same kind of difficulty that discouraged me from further work along these lines. How to deal with the passage of time, and the changing costs and information that are a necessary consequence of the passage of time?....The model does not look at the situation as it might be after time zero. In practice, however, the passage of time has two important consequences.
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> The first consequence is that, even if predictions about the future are entirely accurate, opportunity costs change. Once the investment is made, the opportunity costs of production are changed, and are typically lower. This is because the cost of the investment is now sunk, and the opportunity cost is simply that of the variable inputs required to produce output. In general, this presents a dilemma. Prices set at time zero continue to recover total costs but no longer reflect opportunity costs. But prices that change to reflect opportunity costs no longer recover total costs.
>
> If I understand correctly, TELRIC prices seem to avoid this dilemma because they are not claimed to reflect the actual opportunity costs faced by a particular firm at any particular time. Rather, they reflect the costs that would be faced by a hypothetical efficient firm at any point in time. As such they are independent of the actual investment made by the regulated firm, and continue to recover total costs, at least as foreseen at time zero.
>
> However, this does not overcome the second consequence of the passage of time. In reality, things never turn out precisely as expected. It is impossible for a regulator, or anyone else, to predict with complete accuracy the future path of costs, technology, demands, and other relevant parameters. It follows that TELRIC prices, as set at time zero and as assumed to be recalculated at intervals into the future, will fail to recover total costs exactly. They will under-recover or

[9] For example, the fact that network must be deployed over considerably long time periods might be accounted for by using lower utilization rates than might be appropriate in a static model. While this would certainly be justified, it is difficult to know how much lower the utilization rates should be. In the end, the only viable validation check is to compare the model outputs with embedded cost, thus undermining any advantage of using forward-looking cost to begin with.

[10] Stephen Littlechild, "Reflections on Incentive Regulation," *Review of Network Economics*, Vol. 2, Issue 4, December 2003, at pages 303-306.

> over-recover costs according as the regulator underestimates or overestimates the future rate of cost reduction…..
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> If TELRIC pricing means that regulators review costs at periodic intervals and revise allowed charges accordingly, this will mean a corresponding degree of uncertainty about what future charges will be. Competitors will therefore be vulnerable to the forecasting assumptions and errors of the regulator. They will be less able to predict what their costs will be than if the regulator fixed these charges for the life of the relevant assets or, which may amount to the same thing, if the regulator allowed the network owner to recover the costs of these assets under assumptions that held at the time when the investment was made.

Professor Littlechild was discussing deleterious effects upon competition. The consequences of failure to model dynamics and uncertainty are more pronounced in the case of universal service. In effect, a move to a forward-looking cost standard based on current technology means that incumbents will not recover the total costs of the investments they made in the past using efficient technologies at that time. Whatever the supposed wisdom of this for enhancing competition (and Professor Littlechild has cast doubts upon that), it certainly violates the need for USF to be "predictable and sufficient."

The other implication of dynamics and uncertainty for USF is that any reduction in USF today due to technological progress means that USF has been under-funded in the past. If today's embedded cost is higher than provision using today's efficient technology, then the risk of this reduced asset value should have been reflected in USF in the past. Laffont and Tirole, in their treatise on competition have said:[11]

> For the operator to break even overall, a markup on access corresponding to the risk of technological progress must be charged as long as users do not have an alternative to the operator's equipment. This markup on access needed to compensate the owner for the one-sided option enjoyed by the user is similar to the premium received by an insurer when the insuree does not have an accident.

[11] J. Laffont and J. Tirole, *Competition in Telecommunications*, MIT Press, 2000, page 157.

> So far, so good. But, suppose now that the regulator attempts to reduce even slightly the markup on access. Then no investment takes place until uncertainty is resolved, as the markup is no longer sufficient to offset the users' option value. The users' one-sided option combined with the regulator's pressure on access charges leads potential equipment owners to exercise their option to wait to invest in facilities.

The intuition is straightforward. Suppose you are going to lease a new personal computer to somebody over a two-year time period on a fixed term contract. Suppose that a new computer will become available in one year's time that is 50% cheaper than today's model. Assume that the lessee has the option to pull out of the contract after one year. The only way in which you would be willing to undertake the investment today and sign this lease is if you recover a sufficient portion of the cost during the first year in order to price competitively in the second year.

In effect, those parties that would have the FCC shift to a forward-looking cost standard, which dramatically leads to lower USF, would have the incumbents fail to receive full compensation for their investments, which were efficient at the time they were made.[12] This means that past USF was not sufficient. The consequences for future rural investment are profound and disturbing.

The need for dynamic cost models is relevant to another issue raised by the Joint Board: the feasibility of developing and using a least cost model for provision of universal service that would incorporate both wireless and wireline technological options. Such a model would estimate the costs for both technologies and USF would be based on the least cost technological

[12] For purposes of this discussion, I am granting the possibility that forward-looking costs are, in fact, far lower than embedded cost due to rapid improvements in technology. I don't believe this to be an accurate portrayal of the facts, but it is the case that has been made by many parties to the USF proceedings.

option. Aside from the practical difficulties of developing a model that is accurate and can be validated (discussed above), there is a more profound conceptual problem with such an approach. Suppose we grant, for the sake of argument, that wireless technology is determined to be less costly than wireline technology for provision of universal service in a particular small community.[13] It would not be appropriate to use this to reduce the level of USF support received by an incumbent rural carrier using wireline technology unless the prior USF support had already recovered enough of the embedded cost to ensure complete recovery of costs at the now reduced level of support. That is, the embedded cost of service incorporates a depreciation cost which should reflect the degradation of value of assets that may result from the improvement of technology. If wireless technology suddenly becomes more inexpensive than wireline technology, then this fact should have been reflected in the depreciation rates of those wireline assets so that the costs of those assets are fully recovered. Failure to do so would constitute an economic taking, and perhaps an illegal taking as well. Most importantly, it would undermine incentives to invest in new technology since the ultimate recovery of costs would be jeopardized. There is no free lunch: carriers will not make investments in high-cost areas that enable comparable service at comparable rates if their support is only to be reduced whenever a newer and more inexpensive technological option becomes available.

Before embarking on forward-looking cost as a mechanism for reducing the costs of providing universal service, it is advisable to consider a comparable attempt at reducing the costs of another important social objective: health care for the elderly. In 1983, the federal government instituted a system of diagnostic related groups (DRGs), which attempted to standardize medical

[13] I am not conceding the viability of this assumption: the relative costs of these technologies for provision of an acceptable quality of universal service would need to be demonstrated. I consider these hypothetical conditions merely to point out the more crucial question of the adequacy of funding.

treatments and provide cost-reducing incentives to providers. Under the DRG system, providers are compensated on the basis of statistical averages of costs for a variety of conditions: if their actual costs are higher than these averages, they must absorb the difference while if their actual costs are lower, they get to keep the difference. This is analogous to a forward-looking cost mechanism that would standardize USF and divorce it from the actual costs of the rural ILECs.

The ability of DRGs to reduce health care costs is hotly debated. Most importantly, however, the effect of DRGs on the quality of medical care should caution us about the effects of such an incentive system. One observer of the DRG system has concluded:

> Now that the system has been in operation for a decade, it is clear that the data do not support claims that it improves the quality of care; in fact, they indicate that it has had the opposite effect, that the quality of care has deteriorated under the DRGs. That state of affairs is bound to continue as long as cost cutting remains the nation's most urgent priority in health care planning.[14]

Leyerle describes in length the difficulties in implementing the DRG system. It inadequately dealt with severity of illness, resulting in a proliferation of DRG codes to attempt to capture quality differences hidden in the statistical average costs for different treatments. There is little evidence that it was successful in reducing health care costs. There is ample evidence that it has been an administratively costly system to implement and operate. And, most importantly, any cost reductions it may have achieved may have come at the expense of the quality of the services delivered.

The use of the DRG system in Medicare has resulted in a bifurcated system where treatment for the elderly differs from that available for privately insured patients. Whatever the arguable

[14] Betty Leyerle, *The Private Regulation of American Health Care*, M.E. Sharpe, Inc., 1994, at page 62.

merits of a universal service mechanism based on a similar dual standard, it is clearly inconsistent with the Act's mandate that comparable services be available at comparable rates. The Act is clear in that the provision of quality universal service is the priority of USF. Advocates would need to provide evidence that using forward-looking cost for determining USF can both reduce costs relative to the use of embedded cost while maintaining and enhancing the quality of service. Experience with the DRG system in health care provides caution concerning the wisdom of such claims.

4. Investment Incentives

There are two types of investment effects to consider: investment in cost-reducing effort, and investment in infrastructure. *In theory*, forward-looking costs have the advantage of providing superior incentives for cost reducing innovation and effort compared with embedded costs. *In practice*, this advantage may be offset by a number of considerations:

- Embedded costs are subject to oversight at a number of levels, including state regulators, federal regulators, NECA, the Rural Utilities Service, and owners.
- The theoretical inadequacy of cost reducing incentives of rate of return regulation is offset by the presence of time lags in rate of return proceedings. That is, the longer the time between proceedings, the stronger the incentives for cost reducing innovation.
- The fact that current USF does not support 100% of the excess of company costs over national average per line costs, means that ILECs still bear some portion of their higher than average costs. This incomplete cost recovery mitigates some of the weaker cost reduction incentives inherent in rate of return regulation and USF based on embedded cost.

- USF has been frozen for periods of time, thereby reducing the probability of cost recovery for investments and operating expenses, enhancing incentives for cost-reduction.[15]
- Competitive pressures exist in rural service areas. While these are less pronounced than in densely populated urban areas, there are still competitive threats for the wireline business of larger customers and from wireless services. Any such competitive pressure will enhance cost reducing incentives.
- Forward-looking costs are not the only mechanism that provides improved cost reduction incentives. In theory, any mechanism that breaks the tie between support and actual costs incurred will possess superior cost reducing incentives. This means that a cost standard that results in support greater than embedded cost will provide superior cost reducing incentives, as long as the standard is unaffected by the level of each company's actual cost level.
- However, such enhanced cost reducing incentives are more illusory than real if the cost standard is not accurate. Even if the aggregate level of forward-looking costs could be accurately estimated, disaggregated costs are likely to be too high in some service areas and too low in others. This will distort investment incentives (producing excessive investment in some rural areas and deficient investment in others).
- To the extent that forward-looking cost includes speculative efficiencies not captured in embedded cost, the question is whether a lower level of universal service funding will lead to more or less investment in rural infrastructure. The answer is less.

[15] I am not recommending caps on USF. They are incompatible with the sufficiency requirements in the Act. To the extent they have been employed, however, they mitigate concerns about potential inefficient cost-reduction incentives for rural ILECs.

This last point refers to the other type of investment effect to be considered – that of investment in infrastructure. The theoretical advantage of forward-looking cost is that it should represent the actual resources that would be required today to provide universal service, rather than the costs that have been incurred in the past. This potential theoretical advantage can only be realized if forward-looking costs can be accurately measured. As discussed in the last section, rural high-cost areas pose significant hurdles for accurate forward-looking cost estimation, and validation is necessary but intractable. This means that these *theoretical* advantages are unlikely to be realized in *practice*.

The Act's universal service provisions are clearly most concerned with continuing and increasing investment in rural infrastructure, and not cost reduction *per se*. Abandoning embedded cost in favor of forward-looking cost would seriously jeopardize future rural investment for two related reasons. First, a lower level of support would make carriers less able to finance investment. Since the return on future investment is reduced, we should expect less new investment to take place.

Second, changing the rules has its own incentive effect. Regulatory commitment is a prime concern of the economics of regulation literature.[16] If regulators establish a practice of reducing support whenever a new technology becomes available (or whenever a new cost model produces lower cost estimates, regardless of their validity), future investment will be reduced. Both the return on investment and its risk are affected. Full recovery is jeopardized and capital will be more costly to obtain.

[16] For example, see *Privatization, Restructuring, and Regulation of Network Utilities*, by David. M. Newbery, The MIT Press, 2000.

The experience with forward-looking costs as the basis for establishing unbundled network element (UNE) prices should not be overlooked. Whatever the merits of the forward-looking cost standard, the continued litigation and uncertainty is undeniable. The evidence shows that both RBOC and CLEC investment are reduced in the face of lower UNE prices, ostensibly resulting from more vigorous application of the forward-looking cost standard.[17] Rural America can ill afford to repeat this experience with universal service funding.

5. Competitive Issues

The choice between basing USF on forward-looking or embedded cost has no direct impact on competition. Commission rules provide for support to be portable to all "eligible telecommunications carriers" (ETCs). Designation of competitive ETCs (CETCs) has been controversial but is not an issue of cost methodology. Support of CETCs, however, is related to cost methodology since current CETC support is equal to the per line support received by the rural ILEC. It has been claimed that this equal support policy is necessary for competitive neutrality. It is not.

CETC support should be not be based on the ILEC's costs. If ILEC embedded costs are believed to be excessive due to waste and inefficiency, then there is no need for competitors to receive this inefficient support in order to compete. CETCs merely need to avoid inefficiency and can compete on a level playing field. If ILEC embedded costs are believed to be above forward-looking cost, not through any inefficiency, but merely due to improvements in technology, then CETCs do not require this level of support since the (presumably lower) forward-looking cost

[17] See Declaration of Dale E. Lehman, "Investment and the Level of UNE-P Rates: A Critique of the Willig Study, filed on behalf of Qwest, WC Docket No. 03-173, January 30, 2004.

should be sufficient for them to provide universal service.[18] If ILEC support, based on embedded cost, represents the true efficient costs for the ILEC, then there is no reason for CETCs to receive this same level of support.

CETC support should be based on CETC costs since it is those costs that represent the resources consumed to provide universal service by CETCs. In theory, embedded cost for CETCs could work – but, given the administrative costs of establishing this accounting system, a forward-looking cost model might be a more reasonable compromise. Alternatively, it may be possible to create an "average cost-like" methodology using a sample of embedded costs for CETCs. There is no reason to believe that ILEC embedded costs are a good measure of costs, forward-looking or embedded, for a CETC – particularly for CETCs utilizing a different technological platform to deliver universal service.

6. Conclusions

The Act has multiple objectives and no cost concept is perfect. The Commission needs to strike a balance between promoting investment, reducing costs, and protecting the principle of comparable services at comparable rates. A forward-looking cost standard falls short of this goal. The use of embedded cost for rural ILECs is a better alternative.

[18] Note that this argument is not symmetric: it does not follow that it would be sufficient for the ILEC to receive the (presumably lower) forward-looking cost. This is because the ILEC has already invested in the older technologies reflected in their embedded costs. This is the issue of dynamics discussed earlier. Under the assumptions of this particular argument, the ILEC's actual forward-looking cost would be higher than the forward-looking cost of a new entrant with no current investment in facilities.

My conclusion regarding continued use of embedded cost for rural ILECs is not unlike Winston Churchill's conclusion about democracy: "It has been said that democracy is the worst form of government except all the others that have been tried." A similar sentiment was expressed by Benjamin Franklin regarding the Constitution:

> In these sentiments, sir, I agree to this Constitution with all its faults – if they are such—because I think a general government necessary for us … I doubt, too, whether any other convention we can obtain may be able to make a better Constitution; for, when you assemble a number of men, to have the advantage of their joint wisdom, you inevitably assemble with those men all their prejudices, their passions, their errors of opinion, their local interests, and their selfish views. From such an assembly can a perfect production be expected?.... Thus I consent, sir, to this Constitution because I expect no better, and because I am not sure that it is not the best.[19]

Forward-looking cost is a worse alternative to embedded cost for determining USF support. The Act is clear in its goal of achieving "predictable and sufficient" support for "comparable services at comparable rates." Whatever the merits of forward-looking cost as a theoretical construct, they will thwart these objectives. Support that results from forward-looking cost models, with their inherent methodological difficulties, cannot be predictable and is likely to not be sufficient for many rural ILECs.

[19] Benjamin Franklin's closing speech to the constitutional convention, September 17, 1787, *Benjamin Franklin: an American Life*, Walter Isaacson, Simon and Schuster, New York, New York, 2003, pp 457-458.